CLAIMS

1. A defect evaluation apparatus, comprising a source section having a source for generating positrons and a moderator for decelerating the positrons, a sample holding section for holding a sample to be measured, a transfer section for transferring the positrons from the source section to the sample holding section, and detection means for detecting γ rays emitted from the sample being measured, characterized in that said apparatus further comprising heating means for heating the moderator in a position where there is a possibility of the source being thermally damaged if there is no protection means mentioned below in the source section, and protection means for protecting the source from the heating means and heated moderator when the moderator is being heated using the heating means.

2. The defect evaluation apparatus according to Claim 1, wherein the protection means is disposed outside of the space between the moderator and the source when the positrons decelerated via the moderator are injected into the sample, and the protection means is disposed in the space between the moderator and the source when the moderator is heated by the heating means.

3. The defect evaluation apparatus according to Claim 1 or 2, wherein the heating means faces the moderator when the moderator is heated by the heating means.

4. The defect evaluation apparatus according to any one of Claims 1 to 3, wherein the moderator is held by moderator holding means, the moderator holding means and the protection means are integrally formed, the moderator faces the source when the positrons decelerated via the moderator are injected into the sample, and the moderator faces the heating means and the protection means faces the source when the moderator is heated by the heating means, whereby the source is protected from thermal attack from both the heating means and the

moderator.

5. The defect evaluation apparatus according to Claim 3, wherein the moderator is held by moderator holding means, the moderator holding means and the protection means are integrally formed in an L-shape body, the L-shaped body is rotatable so that the moderator or the protection means can be made to face the source, and the moderator faces the heating means and the protection means faces the source when the moderator is heated by the heating means, whereby the source is protected from photon irradiation from both the heating means and the moderator.

6. The defect evaluation apparatus according to any one of Claims 1 to 5, wherein the moderator is rotatable around an axis perpendicular to an orbit of the positrons from the source to the moderator when positrons are injected into the sample so that the moderator can face the heating means.

7. The defect evaluation apparatus according to any one of Claims 4 to 6, further comprising movable means for moving the source away from the moderator so that the moderator is rotatable when the moderator is to be rotated for heating the moderator by the heating means and then making the heating means face the moderator, and for moving the heating means away from the moderator so that the moderator is rotatable when the moderator is to be rotated for injecting the positrons decelerated via the moderator into the sample and then making the moderator face the source after the moderator is heated by the heating means.

8. The defect evaluation apparatus according to any one of Claims 1 to 7, wherein the moderator is formed from a material selected from tungsten, nickel and iridium.

9. The defect evaluation apparatus according to any one of Claims 1 to 8, wherein the moderator is selected from a thin film moderator, a parallel ribbon

type moderator, and a combination of a thin film moderator and a parallel ribbon type moderator.

10. The defect evaluation apparatus according to Claim 9, wherein the moderator is a combination of a thin film moderator and a parallel ribbon type moderator, and D/W = 0.3 to 1.2 wherein D is the gap between adjacent ribbons of the parallel ribbon type moderator and W is the width of the parallel ribbon type moderator.

11. The defect evaluation apparatus according to any one of Claims 1 to 10, wherein the moderator is heated at a temperature of in the range from 2000 to 2500°C when the moderator is heated by the heating means.

12. The defect evaluation apparatus according to any one of Claims 1 to 11, wherein the heating means is an electron beam generator.

13. The defect evaluation apparatus according to Claim 12, wherein the electron beam generator emits an electron beam such that the moderator is selectively irradiated by the electron beam.

14. The defect evaluation apparatus according to any one of Claims 1 to 13, wherein the detection means is comprised of two γ ray detectors for detecting γ rays generated by annihilation of positrons and said two γ ray detectors are arranged facing each other across the sample, said two γ ray detectors are connected to a circuit for measuring the detection timing for each γ ray detected by said two γ ray detectors and for checking whether two γ rays simultaneously detected by said two γ ray detectors are two γ rays simultaneously emitted in opposite directions by the annihilation of one positron incident on the sample, whereby energy spectrums of γ rays simultaneously emitted in opposite directions by the annihilation of one positron incident on the sample and detected by said two γ ray detectors are measured.

15. A defect evaluation apparatus, comprising a source section having a source for generating positrons and a moderator for decelerating the positrons, a sample holding section for holding a sample to be measured, a transfer section for transferring the positrons from the source section to the sample holding section, and detection means for detecting γ rays emitted from the sample being measured, wherein the detection means is comprised of two γ ray detectors for detecting γ rays generated by annihilation of positrons and said two γ ray detectors are arranged facing each other across the sample, said two γ ray detectors are connected to a circuit for measuring the detection timing for each γ ray detected by said two γ ray detectors and for checking whether two γ rays simultaneously detected by said two γ ray detectors are two γ rays simultaneously emitted in opposite directions by the annihilation of one positron incident on the sample, whereby energy spectrums of γ rays simultaneously emitted in opposite directions by the annihilation of one positron incident on the sample and detected by said two γ ray detectors are measured.

16. The defect evaluation apparatus according to any one of Claims 1 to 15, wherein the transfer section comprises a curve section for achieving energy discrimination by means of a magnetic field, and a linear section for reducing a background.

17. The defect evaluation apparatus according to any one of Claims 1 to 15, wherein the transfer section comprises a curve section for achieving energy discrimination by means of a magnetic field.